PATENT

Attorney Docket No. SIC-01-007

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of:

TADASHI ICHIDA

Application No.: 10/001,324

Filed: November 23, 2001

For: METHOD AND APPARATUS FOR SHIFITNG A BICYCLE TRANSMISSION

Examiner: Vicky A. Johnson

Art Unit: 3682

CORRECTED APPEAL BRIEF

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

In response to the office action dated August 17, 2006, this is a corrected appeal brief for the above-captioned matter.

I. Real Party In Interest

The assignee and real party in interest is Shimano, Inc., a Japanese corporation having a principal place of business in Osaka, Japan.

II. Related Appeals And Interferences

There are no prior or pending appeals, interferences or judicial proceedings known to the appellant, to appellant's legal representative, or to the assignee which may be related to, directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending appeal.

III. Status Of Claims

Claims 1-7, 13-28 and 34-38 are pending under final rejection and are under appeal. Claims 8-12 and 29-33 are allowed.

IV. Status Of Amendments

No amendment was filed subsequent to final rejection.

V. Summary Of Claimed Subject Matter

The invention is directed to a bicycle gear shifting system comprising two transmissions (e.g., chain derailleurs), each of which separately selects a gear to produce a combined gear ratio. The objective is to reduce the number of movements of the two transmissions necessary to achieve a desired gear ratio. This is accomplished when appropriate by diverting the transmissions to move to a destination gear ratio other than the originally requested gear ratio in order to minimize the combined movements of the two transmissions, wherein the destination gear ratio is in close proximity to the originally requested gear ratio.

An embodiment of the claimed subject matter is shown in Figs. 1 and 2 and described at pages 4-6 of the patent application. As applied to that embodiment, the subject matter recited in independent claim 1 is directed to an apparatus for controlling a first bicycle transmission (front derailleur (70), page 4, lines 11-13) and a second bicycle transmission (rear derailleur (74)) which, in combination, set a speed stage (gear ratio) of the combined bicycle transmissions, comprising:

a transmission position communication path (96) (page 5, lines 1-5) for communicating information indicating the operational position of the first transmission (70) and the second transmission (74) (from front and rear derailleur position sensors (87, 88));

a transmission command communication path (94) (page 5, lines 1-5) for communicating information for controlling the operation of the first transmission (70) and the second transmission (74);

a shift command communication path (102) (page 5, lines 5-8) for communicating electronic shift commands (from a shift command unit (98)) to select a speed stage of the bicycle; and

a transmission control unit (90) operatively coupled to the shift command communication path (102), to the transmission position communication path (96) and to the transmission command communication path (94) for receiving the shift commands (from shift command unit (98)) and the information indicating the operational position of the first transmission (70) and the second transmission (74) (from front and rear derailleur position sensors (87, 88)) and for generating the information for controlling the operation of the first transmission (70) and the second transmission (74) (page 5, lines 1-8).

As discussed at page 6, lines 1-6, when the transmission control unit (90) receives at least one shift command requesting a shift through N speed stages to a requested destination speed stage, where N is an integer greater than one, the transmission control unit (90) generates information for causing the first transmission (70) and the second transmission (74) in combination to move a total of M times to move to a different destination speed stage that has a gear ratio in close proximity to a gear ratio of the requested destination speed stage, where M is an integer less than N. This is done without regard to whether or not the first transmission (70) and the second transmission (74) would be temporarily set in a speed stage outside a range between the origin speed stage and the requested destination speed stage when moving from the origin speed stage to the requested destination speed stage.

Independent claim 20 is directed to a bicycle transmission comprising:

a plurality of front sprockets (62) (Fig. 1, page 4, lines 7-9);

a front derailleur (70) for moving a chain (66) among the plurality of front sprockets (62) (page 4, lines 10-13);

a front derailleur motor (82) (Fig. 2, page 4, lines 14-16) for moving the front derailleur (70);

a plurality of rear sprockets (56) (Fig. 1, page 4, lines 6-7);

a rear derailleur (74) for moving the chain (66) among the plurality of rear sprockets (page 4, lines 12-13);

a rear derailleur motor (88) (Fig. 2, page 4, lines 16-18) for moving the rear derailleur (74);

a front derailleur position sensor (87) for providing a signal indicating a front sprocket position of the front derailleur (70) (page 4, lines 20-24);

a rear derailleur position sensor (88) for providing a signal indicating a rear sprocket position of the rear derailleur (page 4, lines 20-24);

wherein the front sprocket position of the front derailleur and the rear sprocket position of the rear derailleur set a speed stage of the bicycle transmission (e.g., page 8, Table 2);

a transmission position communication path (96) (page 5, lines 1-5) operatively coupled to the front derailleur position sensor (87) and to the rear derailleur position sensor (88) for communicating the signals indicating the front sprocket position and the rear sprocket position (from front and rear derailleur position sensors (87, 88));

a transmission command communication path (94) (page 5, lines 1-5) operatively coupled to the front derailleur motor (82) and to the rear derailleur motor (88) for communicating information for controlling the operation of the front derailleur motor (82) and the rear derailleur motor (82);

a shift command communication path (102) for receiving electronic shift commands (from shift command unit (98)) to set a desired speed stage (page 5, lines 5-8);

a transmission control unit (90) operatively coupled to the shift command communication path (102), to the transmission position communication path (96) and to the transmission command communication path (94) for receiving the shift commands (from shift command unit (98)) and the signals indicating the front sprocket position and the rear sprocket position (from front and rear derailleur position sensors (87, 88)) and for generating the information for controlling the operation of the front derailleur motor (82) and the rear derailleur motor (88)(page 5, lines 1-8);

As discussed at page 6, lines 1-6, when the transmission control unit (90) receives at least one shift command requesting a shift through N speed stages to a requested destination speed stage, where N is an integer greater than one, the transmission control unit (90) generates information for causing the front derailleur (70) and the rear derailleur (74) in combination to move a total of M sprocket positions to move to a different destination speed stage that has a gear ratio in close proximity to a gear ratio of the requested destination speed stage, where M is an integer less than N. This is done without regard to whether or not the first transmission (70) and the second transmission (74) would be temporarily set in a speed stage outside a range between the origin speed stage and the requested destination speed stage when moving from the origin speed stage to the requested destination speed stage.

Independent claim 22 is directed to a method for controlling a first bicycle transmission (front derailleur (70), page 4, lines 11-13) and a second bicycle transmission (rear derailleur (74)) which, in combination, set a speed stage (gear ratio) of the combined bicycle transmissions, comprising the steps of:

receiving, by a transmission control unit (90), information indicating the operational position of the first transmission (70) and the second transmission (74) (e.g., from front and rear position sensors (87, 88), page 5, lines 1-5);

receiving, by the transmission control unit (90) , at least one electronic shift command requesting a shift through N speed stages to a requested destination speed stage, wherein N is an integer greater than one (page 5, lines 5-8; page 6, lines 1-3);

As discussed at page 6, lines 1-6, the transmission control unit (90) generates information for causing the first transmission (70) and the second transmission (74) in combination to move a total of M times to move to a different destination speed stage that has a gear ratio in close proximity to a gear ratio of the requested destination speed stage, wherein M is an integer less than N. This is done without regard to whether or not the first transmission (70) and the second transmission (74) would be temporarily set in a speed stage outside a range between the origin speed stage and the requested destination speed stage when moving from the origin speed stage to the requested destination speed stage.

VI. Grounds Of Rejection To Be Reviewed On Appeal

Claims 1-7, 13, 18, 20-28 and 34 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ethington (US 5,681,234) in view of Browning (US 5,261,858).

Claims 14-16 and 35-37 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ethington in view of Browning and Colbert, et al (US 5,213,548).

Claims 17, 19 and 38 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ethington in view of Browning and Spencer, et al (US 6,047,230).

VII. Arguments

Rejection under 35 U.S.C. §103(a) over Ethington in view of Browning

Claims 1-7, 13, 18, 20-28 and 34.

Ethington discloses an automatic bicycle transmission wherein sprocket combinations representing successively increasing gear ratios may be stored in a table (See, e.g., Table II at column 12), and wherein an electronic controller (72, Fig. 7) operates front and rear bicycle derailleurs (36, 38, Fig. 1) to sequentially upshift from the lowest to the highest gear ratio and sequentially downshift from the highest to the lowest gear ratio. As properly noted in the middle paragraph of page 3 of the final office action, Ethington does not disclose a transmission control unit that receives at least one shift command requesting a shift through N speed stages to a destination speed stage, where N is an integer greater than one, such that the transmission control unit generates information for causing the first transmission and the second transmission in combination to move a total of M times to reach the destination speed stage, where M is an integer less than N. It also should be noted that Ethington always shifts to the requested destination gear ratio. Ethington does not shift to a destination gear different from the one requested as recited in independent claims 1 and 20.

Browning likewise discloses an automatic bicycle transmission wherein front and rear derailleurs are operated to produce a desired gear ratio. However, Browning operates to avoid what he terms "illegal gears." The concept is discussed at column 5, lines 10-52. An illegal shift is a shift from a first gear to a second gear such that the bicycle must transition through a third gear that is not between the first and second gears. Such a third gear may occur because the front and rear derailleurs described therein operate one at a time, rather than simultaneously.

The reason why such a transition is undesirable is the effect on the rider while pedaling. For example, when the third gear is easier to pedal than a gear in the range between the first and second gears, then the pedaling resistance suddenly and temporarily decreases. The effect on the rider can be the same as if the chain fell off of the bicycle. On the other hand, when the third gear is harder to

pedal than a gear in the range between the first and second gears, then the pedaling resistance suddenly and temporarily increases. The effect on the rider can be the same as if the brakes were suddenly applied. A destination gear that avoids these effects when shifting from an original gear is termed a legal gear. Tables 1 and 2 at columns 5 and 6 illustrate legal gears for a particular combination of front and rear sprockets.

As long as the requested gear is legal, the system will move the front and rear derailleurs to the sprocket combination that produces the desired gear ratio. Sometimes, if the requested gear is illegal, the system will move the front and rear derailleurs to a sprocket combination different than the combination that produces the requested gear, but which produces a gear ratio that is closer to the requested gear than the original gear. See column 22, lines 2-11.

The only reason why Browning moves to a destination gear ratio other than the requested gear ratio is to avoid an illegal destination gear. The Appellant submits that, once it is decided not to implement the concept of illegal gears, as recited in independent claims 1 and 20, there is no reason to modify Ethington's system to move to a destination gear other than the one requested. In other words, it makes no sense to discard the illegal gear shift prohibition yet still force a shift from gear 6 to gear 3 when requesting gear 4 (for example).

The office action states at page 4, first paragraph, that the motivation to combine the teachings of Ethington and Browning is "to provide the fastest possible shift between any two gears," referring to column 4, line 47 through column 5, line 68 of the Browning patent. However, nowhere is it stated in the cited text that Browning's system provides the fastest possible shift between any two gears. Browning does not seek to minimize derailleur movement and is not at all concerned about reducing derailleur movement.

The office action then states in the following paragraph that it would be obvious to disregard the first and second transmissions being set temporarily in a speed range outside of a range between origin and destination speed stages, the rationale being that "it has been held that the omission of a step or an element and its function is obvious if the function is not desired." However, no analysis

was provided why one would want to discard the illegal gear shift prohibition and still force a shift from, e.g., gear 6 to gear 3 when requesting gear 4.

This latter justification for the rejection is an example of the application of a *per se* rule of obviousness that "is legally incorrect and must cease." In re Ochiai 71 F.3d 1565, 1572; 37 USPQ.2d 1127, 1133 (Fed.Cir. 1995). *See, also,* Ex Parte Granneman, 68 USPQ.2d 1219 (BdPatApp&Int 2003) (Unpublished).

The foregoing arguments especially apply to method claims 22-28 and 34, for there clearly is no disclosure or suggestion to perform the *method* recited in those claims, including the step of generating, by the transmission control unit, information for causing the first transmission and the second transmission in combination to move a total of M times to move to a different destination speed stage that has a gear ratio in close proximity to a gear ratio of the requested destination speed stage, wherein M is an integer less than N, without regard to whether or not the first transmission and the second transmission would be temporarily set in a speed stage outside a range between the origin speed stage and the requested destination speed stage when moving from the origin speed stage to the requested destination speed stage.

Rejection under 35 U.S.C. §103(a) over Ethington in view of Browning and Colbert, et al (US 5,213,548.

Claims 14-16 and 35-37.

Claims 14-16 and 35-37 add a speed sensor and an automatic shift control unit that generates shift commands based on information received from the speed sensor. Colbert, et al disclose an automatic transmission for a bicycle that shifts gears according to wheel speed. The office action states at page 9, first paragraph, that the motivation to combine the teachings of Colbert, et al with Ethington and Browning is "to improve efficiency," referring to column 3, lines 24-28 of Colbert, et al. However, the cited text does not state that the provision of a speed sensor and an automatic shift control unit improves efficiency. It is more likely that Colbert, et al were referring to their previous statements at column 3, lines 6-17 when discussing the *manual* mode of operation that "the invention enables a bicycle user, instead of adjusting two gear levels while operating the bicycle to reach a

desired gear ratio, the standard technique in current multiple gear bicycles, to simply push a button to accomplish the same result." Since claims 14-16 and 35-37 recite an automatic shift control unit, any motivation to apply the teachings of a manual mode of operation is not applicable.

Rejection under 35 U.S.C. §103(a) over Ethington in view of Browning and Spencer, et al (US 6,047,230).

Claims 17, 19 and 38.

Claims 17, 19 and 38 add a cadence sensor and an automatic shift control unit that generates shift commands based on information received from the cadence sensor. Spencer, et al disclose an automatic transmission for a bicycle that generates shift signals based on sensed speed, sensed crank rotation rate, sensed chain tension, sensed bicycle inclination and sensed derailleur positions. See column 6, line 66 through column 7, line 2. The office action states at page 10, second paragraph, that the motivation to combine the cadence sensor of Spencer, et al with Ethington and Browning is "to increase efficiency and safety," referring to column 2, lines 1-7 of Spencer, et al. However, the quoted phrase appears in a general laudatory statement. Spencer, et al do not single out crank rotation, as opposed to the combined operation of multiple sensors, as the parameter that improves efficiency or safety, if at all. There is no nexus between the alleged benefit of improving efficiency and safety and Spencer, et al's crank rotation speed sensor.

Respectfully submitted,

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VIII. CLAIMS APPENDIX

CLAIM 1. An apparatus for controlling a first bicycle transmission and a second bicycle transmission which, in combination, sets a speed stage of the bicycle, comprising:

a transmission position communication path for communicating information indicating the operational position of the first transmission and the second transmission;

a transmission command communication path for communicating information for controlling the operation of the first transmission and the second transmission;

a shift command communication path for communicating electronic shift commands to select a speed stage of the bicycle;

a transmission control unit operatively coupled to the shift command communication path, to the transmission position communication path and to the transmission command communication path for receiving the shift commands and the information indicating the operational position of the first transmission and the second transmission and for generating the information for controlling the operation of the first transmission and the second transmission;

wherein, when the transmission control unit receives at least one shift command requesting a shift through N speed stages to a requested destination speed stage, where N is an integer greater than one, the transmission control unit generates information for causing the first transmission and the second transmission in combination to move a total of M times to move to a different destination speed stage that has a gear ratio in close proximity to a gear ratio of the requested destination speed stage, where M is an integer less than N, without regard to whether or not the first transmission and the second transmission would be temporarily set in a speed stage outside a range between the origin speed stage and the requested destination speed stage when moving from the origin speed stage to the requested destination speed stage.

CLAIM 2. The apparatus according to claim 1 wherein the information for controlling the operation of the first transmission and the second transmission comprises a first signal for operating a front derailleur and a second signal for operating a rear derailleur.

CLAIM 3. The apparatus according to claim 1 wherein the transmission control unit comprises a table memory for storing a table containing the information for controlling the operation of the first transmission and the second transmission.

CLAIM 4. The apparatus according to claim 3 wherein the first transmission moves to X first transmission positions, wherein the second transmission moves to Y second transmission positions, wherein X any Y both are integers greater than 1, and wherein the table memory contains information for controlling the operation of at least one of the first transmission and the second transmission for each X first transmission position and for each Y second transmission position.

CLAIM 5. The apparatus according to claim 4 wherein the table memory contains information for moving only one of the first transmission and the second transmission by only one of the corresponding first transmission positions and second transmission positions to reach the destination speed stage in response to a shift command requesting a shift through N speed stages to reach the destination speed stage.

CLAIM 6. The apparatus according to claim 4 wherein the table memory contains information for controlling the operation of at least one of the first transmission and the second transmission for shift commands requesting a shift through a single speed stage and for shift commands requesting a shift through N speed stages.

CLAIM 7. The apparatus according to claim 4 wherein the table memory contains information for maintaining both the first transmission and the second transmission stationary in response to a shift command requesting a shift through N speed stages to reach the destination speed stage.

CLAIM 13. The apparatus according to claim 1 further comprising a manually-operated shift control unit operatively coupled to the shift command communication path.

CLAIM 14. The apparatus according to claim 1 further comprising:

a speed sensor operatively coupled to a speed communication path; and

an automatic shift control unit operatively coupled to the speed communication path and to the shift command communication path for automatically generating shift commands based on information received from the speed sensor.

CLAIM 15. The apparatus according to claim 14 wherein the automatic shift control unit generates shift commands based on bicycle speed.

CLAIM 16. The apparatus according to claim 14 wherein the automatic shift control unit generates shift commands based on bicycle acceleration.

CLAIM 17. The apparatus according to claim 1 further comprising:

a cadence sensor operatively coupled to a cadence communication path; and

an automatic shift control unit operatively coupled to the cadence communication path and to the shift command communication path for automatically generating shift commands based on information received from the cadence sensor.

CLAIM 18. The apparatus according to claim 1 further comprising:

a manually-operated shift control unit operatively coupled to the shift command communication path;

a speed sensor operatively coupled to a speed communication path; and

an automatic shift control unit operatively coupled to the speed communication path and to the shift command communication path for automatically generating shift commands based on information received from the speed sensor.

CLAIM 19. The apparatus according to claim 1 further comprising:

a manually-operated shift control unit operatively coupled to the shift command communication path;

a cadence sensor operatively coupled to a cadence communication path; and

an automatic shift control unit operatively coupled to the cadence communication path and to the shift command communication path for automatically generating shift commands based on information received from the cadence sensor.

CLAIM 20. A bicycle transmission comprising:

a plurality of front sprockets;

a front derailleur for moving a chain among the plurality of front sprockets;

a front derailleur motor for moving the front derailleur;

a plurality of rear sprockets;

a rear derailleur for moving the chain among the plurality of rear sprockets;

a rear derailleur motor for moving the rear derailleur;

a front derailleur position sensor for providing a signal indicating a front sprocket position of the front derailleur;

a rear derailleur position sensor for providing a signal indicating a rear sprocket position of the rear derailleur;

wherein the front sprocket position of the front derailleur and the rear sprocket position of the rear derailleur set a speed stage of the bicycle transmission;

a transmission position communication path operatively coupled to the front derailleur position sensor and to the rear derailleur position sensor for communicating the signals indicating the front sprocket position and the rear sprocket position;

a transmission command communication path operatively coupled to the front derailleur motor and to the rear derailleur motor for communicating information for controlling the operation of the front derailleur motor and the rear derailleur motor;

a shift command communication path for receiving electronic shift commands to set a desired speed stage;

a transmission control unit operatively coupled to the shift command communication path, to the transmission position communication path and to the transmission command communication path for receiving the shift commands and the signals indicating the front sprocket position and the rear sprocket position and for generating the information for controlling the operation of the front derailleur motor and the rear derailleur motor;

wherein, when the transmission control unit receives at least one shift command requesting a shift through N speed stages to a requested destination speed stage, where N is an integer greater than one, the transmission control unit generates information for causing the front derailleur and the rear derailleur in combination to move a total of M sprocket positions to move to a different destination speed stage that has a gear ratio in close proximity to a gear ratio of the requested destination speed stage, where M is an integer less than N, without regard to whether or not the first transmission and the second transmission would be temporarily set in a speed stage outside a range between the origin speed stage and the requested destination speed stage when moving from the origin speed stage to the requested destination speed stage.

CLAIM 21. The transmission according to claim 20 wherein a change of gear ratio when the front derailleur moves from a first front sprocket to a second front sprocket is approximately equal to twice a change of gear ratio when the rear derailleur moves from a first rear sprocket to a second rear sprocket.

CLAIM 22. A method for controlling a first bicycle transmission and a second bicycle transmission which, in combination, sets a speed stage of the bicycle, comprising the steps of:

receiving, by a transmission control unit, information indicating the operational position of the first transmission and the second transmission;

receiving, by the transmission control unit, at least one electronic shift command requesting a shift through N speed stages to a requested destination speed stage, wherein N is an integer greater than one;

generating, by the transmission control unit, information for causing the first transmission and the second transmission in combination to move a total of M times to move to a different destination speed stage that has a gear ratio in close proximity to a gear ratio of the requested destination speed stage, wherein M is an integer less than N, without regard to whether or not the first transmission and the second transmission would be temporarily set in a speed stage outside a range between the origin speed stage and the requested destination speed stage when moving from the origin speed stage to the requested destination speed stage.

CLAIM 23. The method according to claim 22 wherein the information for controlling the operation of the first transmission and the second transmission comprises a first signal for operating a front derailleur and a second signal for operating a rear derailleur.

CLAIM 24. The method according to claim 22 further comprising the step of storing a table containing the information for controlling the operation of the first transmission and the second transmission.

CLAIM 25. The method according to claim 24 wherein the first transmission moves to X first transmission positions, wherein the second transmission moves to Y second transmission positions, wherein X any Y both are integers greater than 1, and wherein the storing step comprises the step of storing information for controlling the operation of at least one of the first transmission and the second transmission for each X first transmission position and for each Y second transmission position.

CLAIM 26. The method according to claim 25 wherein the storing step further comprises the step of storing information for moving only one of the first transmission and the second transmission by only one of the corresponding first transmission positions and second transmission positions to reach the destination speed stage in response to a shift command requesting a shift through N speed stages to reach the destination speed stage.

CLAIM 27. The method according to claim 25 wherein the storing step further comprises the step of storing information for controlling the operation of at least one of the first transmission and the second transmission for shift commands requesting a shift through a single speed stage and for shift commands requesting a shift through N speed stages.

CLAIM 28. The method according to claim 25 wherein the storing step further comprises the step of storing information for maintaining both the first transmission and the second transmission stationary in response to a shift command requesting a shift through N speed stages to reach the destination speed stage.

CLAIM 34. The method according to claim 22 further comprising the step of manually generating the at least one shift command.

CLAIM 35. The method according to claim 22 further comprising the steps of:

receiving, by an automatic shift command unit, information from a speed sensor; and

automatically generating shift commands based on information received from the speed sensor.

CLAIM 36. The method according to claim 35 wherein the step of automatically generating shift commands comprises the step of generating shift commands based on bicycle speed.

CLAIM 37. The method according to claim 35 wherein the step of automatically generating shift commands comprises the step of generating shift commands based on bicycle acceleration.

CLAIM 38. The method according to claim 22 further comprising the steps of:

receiving, by an automatic shift command unit, information from a cadence sensor; and

automatically generating shift commands based on information received from the cadence sensor.

IX. EVIDENCE APPENDIX

None

X. RELATED PROCEEDINGS APPENDIX

None